

Regional HOT Lanes Network Feasibility Study

APPENDIX C

CORRIDOR ANALYSIS: I-80 FROM YOLO COUNTY LINE TO I-680

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and

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Introduction

This memorandum applies a project development approach and set of corresponding design principles that were developed in Phase 3 Tasks 22.1 and 22.2 to the specific section of I-80 from the Yolo County Line to the I-680 interchange. Similar memoranda are prepared for other selected corridors in the proposed MTC HOT lane network. These memoranda are intended both to advance the plans for HOT lane development in the corridors under study and to provide a basis for drawing conclusions about the likely impacts, costs, and design issues required to convert or develop HOT lanes in other network corridors not under detailed study.

At the direction of MTC and the Project Steering Committee, this analysis covered two approaches to developing HOT lanes in the corridor, the “Basic Approach”¹ and the “Revised Full Featured Approach”². The primary difference between the two is that in constrained situations the Basic Approach allows for sub-standard inside shoulders and a reduction of lane widths from the 12-foot standard to 11 feet in order to make the added lane fit within available right-of-way, while the Revised Full Featured Approach would maintain Caltrans District 4 preferred design guidance. Under exceptionally constrained conditions where freeway widening is infeasible due to cost or environmental reasons then the outside shoulder may also fall below Caltrans’ 10-foot standard width for short distances.

This memorandum begins with a description of existing conditions in the corridor, followed by sections describing the proposed typical HOT lane sections and ingress and egress points, and closes with a section describing the study team's findings regarding development of HOT lanes in this corridor.

¹ This is derived from the “Rapid Delivery Approach” in Phase 2b of this study

² This is derived from the approach used in Phase 2 of this study, which assumed full Caltrans District 4 preferred design guidance

Existing Description of the Corridor

This corridor is 29.4 miles long, running from the Yolo County Line near the City of Davis to the I-680 interchange. This section of I-80 is a rural freeway passing a series of medium-sized cities (Dixon, Vacaville, Fairfield, and Cordelia) separated by areas of farmland (see Figure 1). The freeway passes through rolling hills between Fairfield and Cordelia.

The section of I-80 under study generally³ has three lanes per direction from Dixon to Vacaville, four lanes per direction from Vacaville to Fairfield, and five lanes per direction west of Vacaville. There are two freeway-to-freeway interchanges (I-505 in Vacaville and I-680 in Cordelia) and 27 other interchanges. Eight of these provide access to the rural road network while the other nineteen provide access to the street network of the cities that the freeway passes through. There are truck weigh stations for both directions of travel between Fairfield and Cordelia (see Figure 2).

This portion of I-80 carries heavy volumes of commuter traffic during peak hours, generally westbound in the morning and eastbound in the evening. During off-peak hours the traffic on this section of I-80 is primarily inter-regional traffic including a large volume of long-distance truck traffic. Daily traffic volumes vary from a low of 101,000 ADT between Davis and Dixon to a high of 213,000 ADT between Fairfield and Cordelia.

There are several major projects taking place in this corridor:

- The I-80/I-680/SR-12 Interchange Project is being done in phases. The first phase was to add eastbound auxiliary lanes to ease merging issues in the short term. Several alternative designs are being studied for braided ramps that will improve operations in the longer term. A surface street connector that will allow local traffic to bypass the freeway is also being developed (scheduled to open in 2011).

³ There are auxiliary lanes in some sections

- A special component of the interchange project is the relocation of the eastbound Cordelia truck scales to a site east of Suisun Creek. This is scheduled for completion in 2014.
- HOV lanes are currently under construction in both directions along an 8.7-mile section between Red Top Road and Air Base Parkway. This will involve widening the freeway to the inside and upgrading the median barrier. This project is scheduled for completion in 2009.
- Ten miles of freeway from Air Base Parkway to Leisuretown Road will be the subject of a pavement rehabilitation and shoulder widening project scheduled for completion in 2009.

HOT Lanes Proposal – Mainline

Providing the main line of the HOT facility varies by section along the freeway. Starting at the Yolo County line and moving west:

- For the section from the Yolo County line to Air Base Parkway, HOT lanes can be added by widening towards the median, which is typically 16 feet wide in this section. Widening to the inside would have the advantage of not affecting the general purpose lanes.

There are three pinch points that would require special treatment:

- *Cherry Glen Road Western Overcrossing* – Cherry Glen Road crosses I-80 at two locations east of Vacaville. The western overcrossing has a split profile with a narrow median that includes a center column (see Figures 3 and 4). The abutments leave little space for widening to the outside. The HOT lane could be accommodated by sacrificing the shoulders and narrowing several lanes.
- *Cherry Glen Road Eastern Overcrossing* – Cherry Glen Road's eastern overcrossing of I-80 has the same difficulties as the western overcrossing, plus the further complication of ramps that extend under the structure (see

Figures 5 and 6). For the Basic Approach, the HOT lane would be accommodated by sacrificing the outside shoulder, narrowing the inside lanes to 11-foot width, and re-striping at this pinch point.

For the Revised Full Featured Approach the least costly approach would be to replace the loop ramps with slip ramps in order to free up space under the structure for the HOT lane. The alternative would be to replace the bridge with a structure wide enough to accommodate an additional lane in each direction passing underneath.

- Sweany Creek Bridges – The eastbound and westbound bridges over Sweany Creek are only about 54 feet wide (see Figures 7 and 8). For the Basic Approach, space for the HOT lane would be created by reducing the shoulders over the length of the bridge and treating it as a pinch point.

For the Revised Full Standard Approach, the HOT lane would be created by widening both the bridges 12 feet towards the median. This would not only have cost implications but also affect the implementation schedule since civil work in the creek bed would likely trigger the need for a full EIR.

- For the section of I-80 from Air Base Parkway to the truck scales, conversion to a HOT lane can be accomplished by adding a 2-foot buffer between the HOV lane and the adjacent general purpose lanes, and providing appropriate signing and tolling equipment. The plans for the HOV lanes currently under construction show that in this section all lanes will be 12 feet wide (see Figure 9). The 2-foot buffer could be created by narrowing the HOV lane and the adjacent general purpose lane to 11 feet, in accordance with the tradeoffs listed in Caltrans *HOV Guidelines*⁴. The other lanes would be unaffected.

However, if the HOT lane is expected to heavily used by buses, then it may be better to narrow the two innermost general purpose lanes and leave the HOV lane at 12-foot width. A third, less desirable alternative would be to reduce the 5-foot inside shoulders to 3-feet to create the buffer.

⁴ Caltrans *High-Occupancy Vehicle Guidelines for Planning, Design, and Operations*, August 2003

- For the section of I-80 from the truck scales westward to I-680, the plans for the HOV lanes currently under construction show that the HOV lane and two outermost general purpose lanes will be 12 feet wide, the remaining general purpose lanes will be 11 feet wide, and the inside shoulder will be 2 feet wide (see Figure 10). Space for the 2-foot buffer can be created by narrowing the HOV lane and inside 12-foot lane to 11 feet, leaving only the outermost lane 12 feet wide.

HOT Lanes Proposal – Ingress and Egress Locations

The approach taken in this study is that the placement of ingress and egress points should be primarily demand-driven; that is, ingress points should be located at a convenient distance downstream of places where large volumes of traffic enter the freeway system and egress points should be located at a convenient distance upstream of places where large volumes of traffic leave the freeway system. Once the high-demand locations were identified, a design analysis was then performed to determine whether an ingress or egress point could fit within the physical constraints of the location. In the event that the point could not be accommodated, a further analysis was performed to determine whether it could be accommodated by shifting the ingress or egress point to a nearby location. Alternate locations for ingress points were sought downstream of the optimal point while alternate sites for egress points were sought upstream, meaning in effect that traffic wishing to enter or leave the HOT lane would have a longer distance in which to weave across the general purpose lanes. If no alternative site could be found, then consideration was given to dropping the proposed site with the assumption that potential users of the point would enter or exit the HOT lanes at other points in the corridor.

The assumed designs of the ingress and egress points are shown in Figures 11 and 12. These designs closely resemble the modified M-5 design for the access points proposed for the I-680 Sunol Express Lane in Alameda and Santa Clara Counties. Caltrans' *HOV Guidelines* also specifies a required minimum distance between an HOV access point and the nearest freeway ramps (see Figure 13).

Figures 14 through 17 show the volumes of traffic entering and exiting I-80 at various points along the corridor⁵ and identify the points originally selected to serve this demand. The observable patterns are summarized below:

- The largest westbound entering volumes occur in Fairfield and Vacaville, with the largest single entering volume coming from SR-12 (see Figure 14).
- The largest westbound exiting volume occurs at I-680. There are moderate exiting flows spread evenly among the exits in Fairfield, Vacaville, and Dixon (see Figure 15).
- The largest eastbound entering volume comes from I-680 (see Figure 16). The remaining eastbound entering volumes are small and spread evenly among the urban interchanges.
- There are moderate westbound exiting volumes at various interchanges in Fairfield and Vacaville, and smaller exiting volumes in Dixon (see Figure 17).

Our analysis of the demand-driven access points is summarized in Tables 1 through 4. The locations of the access points are summarized in Figure 18, and shown in detail in Figures 19 through 25.

Findings Regarding HOT Lane Development in this Corridor

Based on this analysis, the development of HOT lanes in this corridor appears to be feasible. There are physical constraints in several locations but they can be overcome at reasonable cost if some design exceptions are allowed.

⁵ Source: Caltrans' *2007 Traffic Volumes Report*

Table 1: Summary of Characteristics of Proposed Westbound Ingress Points

Site	Location	Proposed Configuration	Minimum ROW required	Actual ROW Available ⁶	Comments
WB-I1	East of Kidwell Road	4GP + 1 AUX + 1 HOT + Ingress	89'	140'	May need widening to outside, and possibly a realignment of the Kidwell ramp
WB-I2	West of Dixon Ave	3GP + 1 HOT + Ingress	67'	110'	Widen roadway towards median and install concrete median barrier.
WB-I3	In the vicinity of Mason St	4GP + 1 HOT + Ingress	78'	105'-110'	Site may be infeasible: Would need to widen Mason Street under-crossing, widen a bridge over a creek, and install concrete median barrier. May also require sound walls and a re-alignment of Mason St Ramp.
WB-I4	East of Air Base Parkway	4GP + 1 HOT + Ingress	78'	90'-105'	Widen roadway towards median and install concrete median barrier. Possible Sound wall extension
WB-I5	Just east of Abernathy Rd	4GP + 1 HOT + Ingress	78'	91'	Widening towards outside (but within existing ROW) and relocate roadside signs and lighting. Provide positive barrier between freeway and linear park. Realign Abernathy Ramp
WB-I6	Just east of Weigh Station	5GP + 1 HOT + Ingress	89'	100'	Widening towards outside (but within existing ROW) and relocate roadside signs and lighting. Provide positive barrier between freeway and linear park. Realign SR-12 Ramp

⁶ ROW Width based on measure width using aerial imagery program, such as Google Earth. ROW was assumed using indicators such as fence lines and sound walls. Exact ROW width assumptions will need to be verified for design using accurate data, such as parcel maps.

Table 2: Summary of Characteristics of Proposed Westbound Egress Points

Site	Location	Proposed Configuration	Minimum ROW required	Actual ROW Available	Comments
WB-E1	East of Currey Rd	3GP + 1 HOT + Egress	67'	90'-110'	Widen towards median and install median barrier. May require positive barrier between I-80 and Milk Farm Rd.
WB-E2	East of Meridian Rd	3GP + 1 HOT + Egress	67'	120'	Improve median barrier. Requires reducing right shoulder by approximately 3'-5'
WB-E3	Central Vacaville				Location dropped because freeway ramps are too closely spaced to allow sufficient weaving space to meet Caltrans guidelines
WB-E4	East of Texas St	4GP + 1 HOT + Egress	78'	82'-94'	Widen towards inside and outside and install concrete center median/retaining wall. EB and WB are split grade so any widening to inside will require a retaining structure. May require a positive barrier between mainline and frontage road
WB-E5	In the vicinity of Air Base Parkway	4GP + 1 HOT + Egress	78'	95'	Widen roadway towards median and install concrete median barrier. May require extension of sound wall and repaving of right shoulder
WB-E6	Just east of Cordelia truck scales	5GP + 1 HOT + Egress	89'	100'	Widening towards outside (but within existing ROW) and relocate roadside signs and lighting. Provide positive barrier between freeway and linear park. Realign SR-12 Ramp

Table 3: Summary of Characteristics of Proposed Eastbound Ingress Points

Site	Location	Proposed Configuration	Minimum ROW required	Actual ROW Available	Comments
EB-I1	Just east of Weigh Station	5GP + 1 HOT + Ingress	89'	110'	Widening towards outside (but within existing ROW) and relocate roadside signs and lighting. Widening of culvert may be required. Realign SR-12 ramp
EB-I2	Central Fairfield				Location dropped because freeway ramps are too closely spaced to allow sufficient weaving space to meet Caltrans guidelines
EB-I3	East of Texas St	4GP + 1 HOT + Ingress	78'	100'	Widen towards inside and outside and install concrete center median/retaining wall. EB and WB are split grade so any widening to inside will require a retaining structure. Extension of sound wall may be required
EB-I4	In the vicinity of Allison Drive	4GP + 1 HOT + Ingress	78'	90'	Widen towards inside and outside, bridge widening at creek, and realignment of Allison Dr. ramps required. Center barrier may need improvement and sound wall may be required.
EB-I5	East of Leisure Town Rd	4GP (or 3GP) + 1 HOT + Ingress	78'	100'	Widen towards inside and widen bridge at creek. Center barrier may need improvement.
EB-I6	East of Currey Rd	3GP +1 HOT + Ingress	67'	100'	Widen towards inside and install center barrier.

Table 4: Summary of Characteristics of Proposed Eastbound Egress Points

Site	Location	Proposed Configuration	Minimum ROW required	Actual ROW Available	Comments
EB-E1	Just east of Weigh Station		89'	110'	Location dropped because there is not sufficient space for both an ingress point and an egress point; the ingress point was considered more important.
EB-E2	Just east of Travis Blvd	4GP + 1 HOT + Egress	78'	105'	Widen towards median and install concrete median barrier. May require sound wall and repaving of right shoulder
EB-E3	Just east of Air Base Parkway	4GP + 1 HOT + Egress	78'	100'-110'	Shifted due to hilly terrain. Widen towards inside and outside and install concrete center median. Widening of culvert and extension of sound wall may be required.
EB-E4	Central Vacaville				Location dropped because freeway ramps are too closely spaced to allow sufficient weaving space to meet Caltrans guidelines
EB-E5	East of Midway Rd	3GP + 1 HOT + Egress	67'	115'	Widen towards inside. Center barrier may need improvement.
EB-E6	East of Pedrick Rd	4GP (or 3GP) + 1 HOT + Egress	67'	100'	Widen towards outside

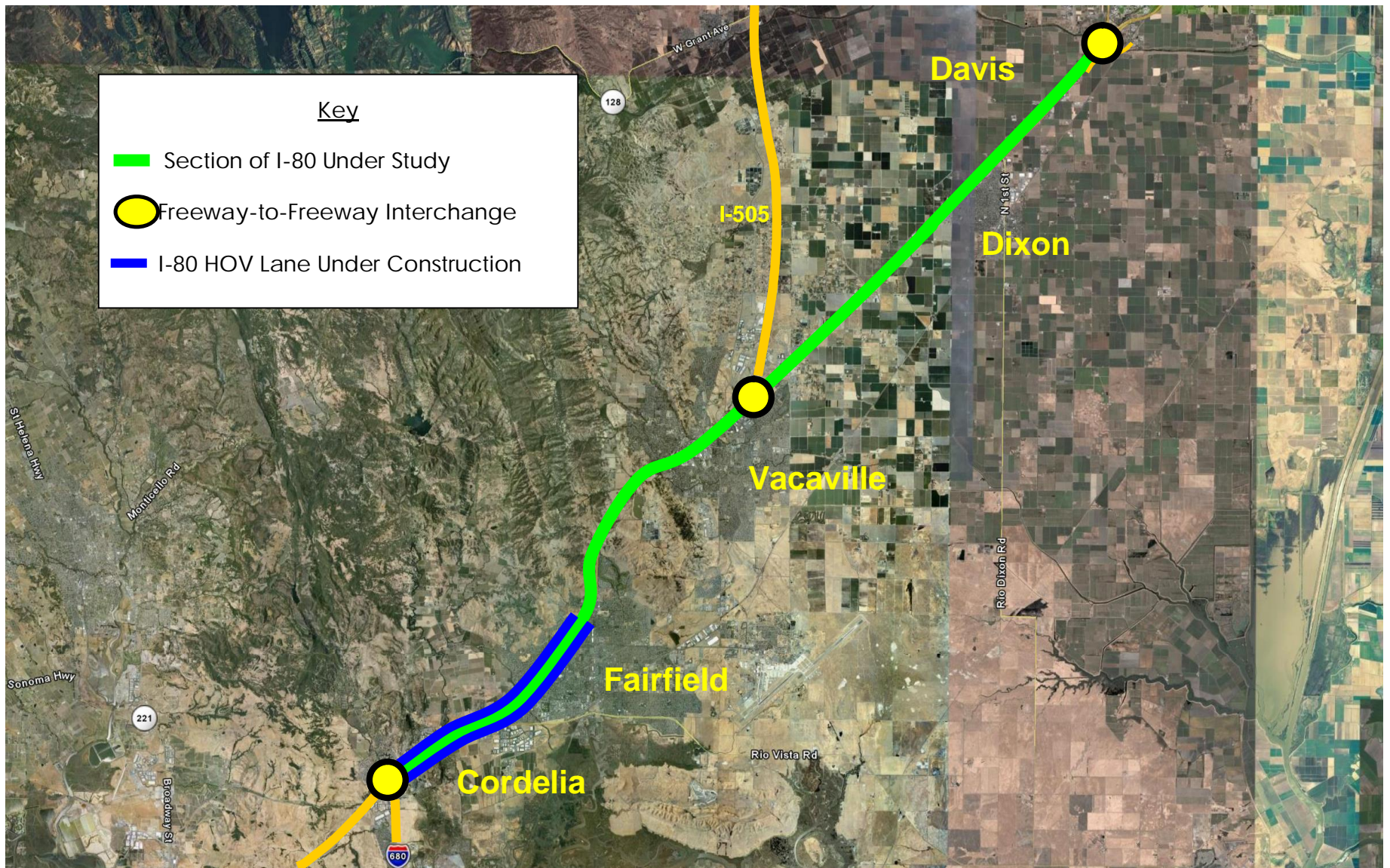


Figure 1: Study Corridor

Note: There is no reduction in the number of lanes in the vicinity of the weigh stations. This means that when the weigh stations are in operation, and trucks are diverted away from the general purpose lanes, then the general purpose lanes have some amount of excess capacity.



Figure 2: Cordelia Truck Scales

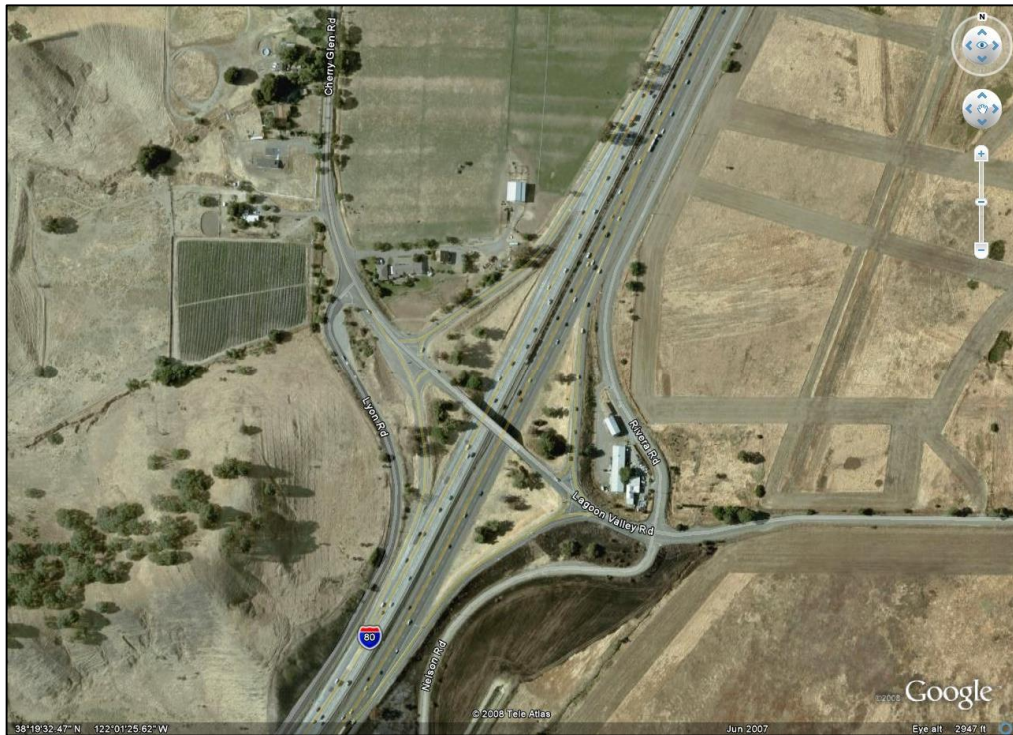


Figure 3: Aerial View of Western Cherry Glen Overcrossing



Figure 4: Western Cherry Glen Overcrossing, Looking Westbound



Figure 5: Aerial View of Eastern Cherry Glen Overcrossing



Figure 6: Eastern Cherry Glen Overcrossing, Looking Eastbound



Figure 7: Aerial View of Sweany Creek Bridges



Figure 8: Westbound Sweany Creek Bridge

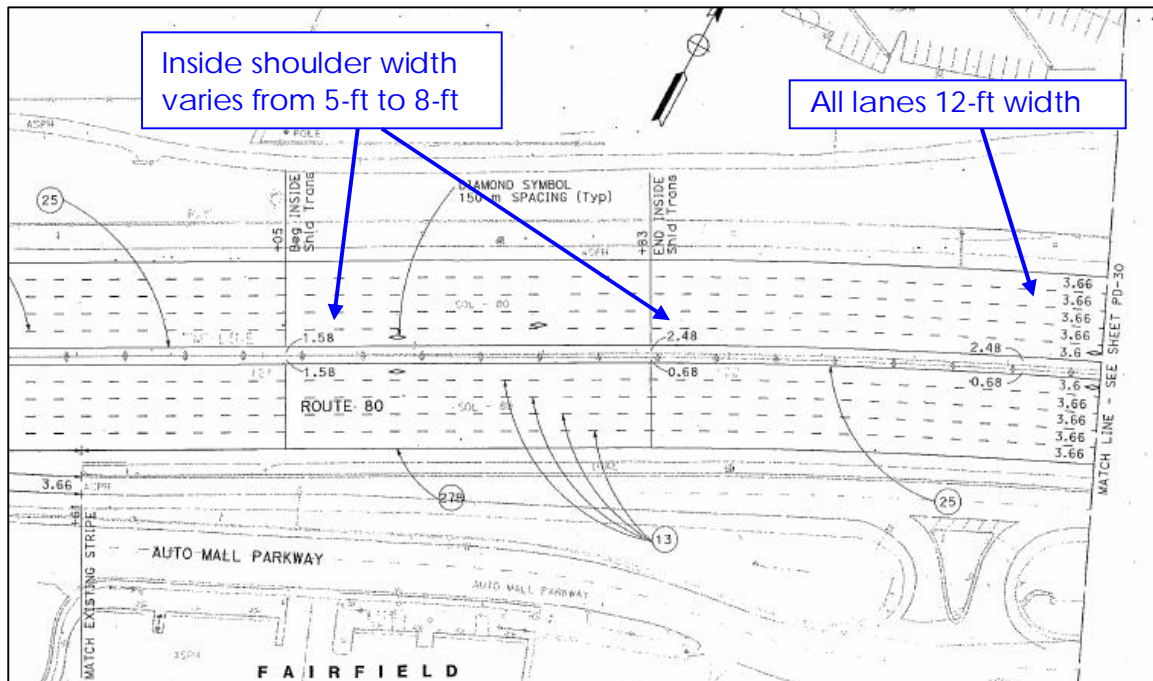


Figure 9: Portion of the Pavement Delineation Plan for the I-80 HOV Lanes Currently Under Construction, East of the Cordelia Truck Scales

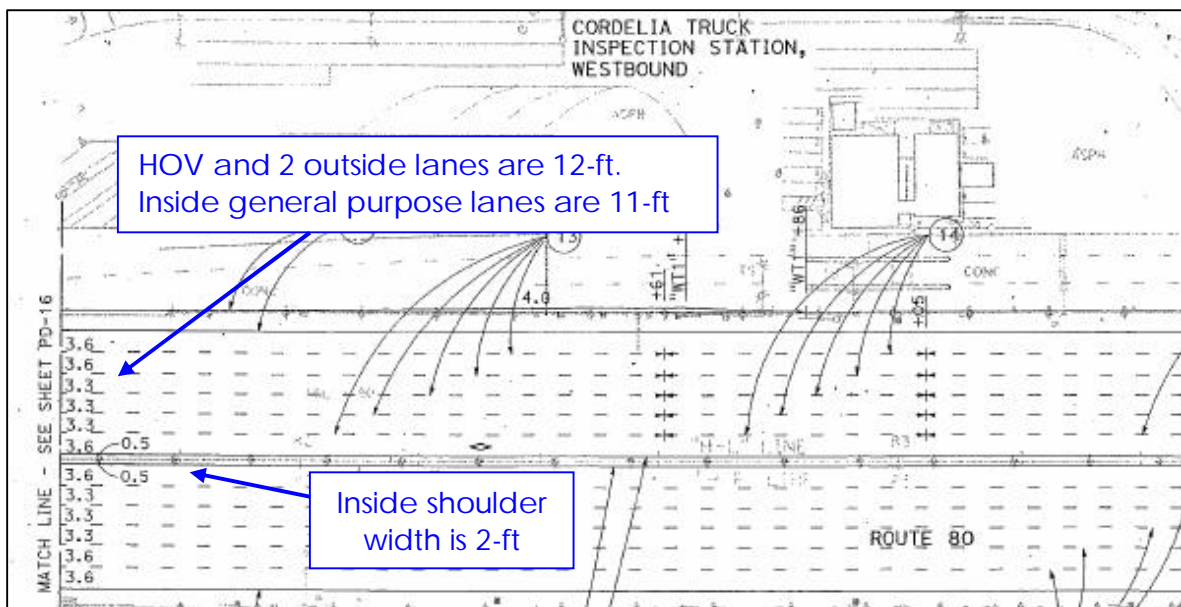


Figure 10: Portion of the Pavement Delineation Plan for the I-80 HOV Lanes Currently Under Construction, at the Cordelia Truck Scales

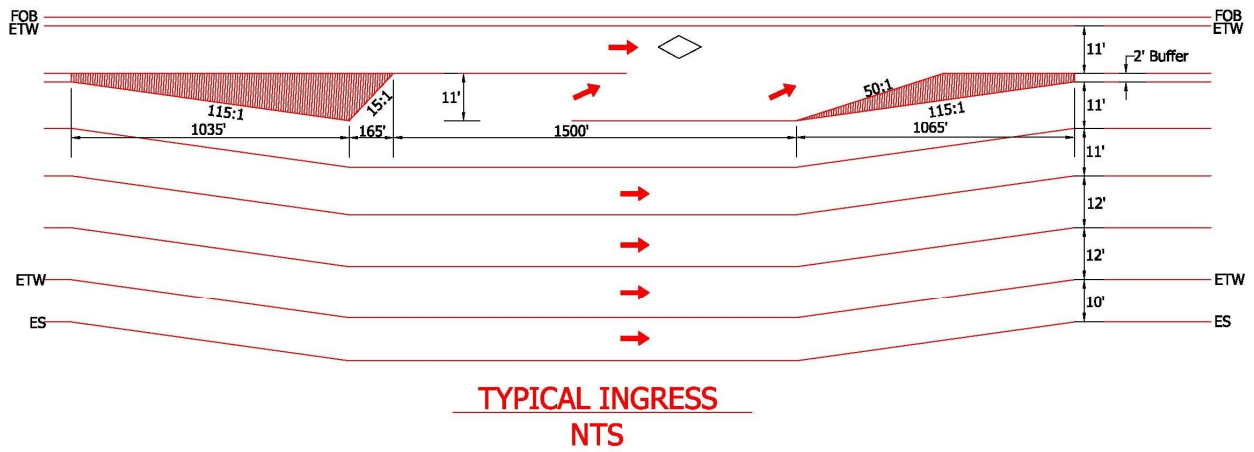


Figure 11: Typical Ingress Point for HOT Lane

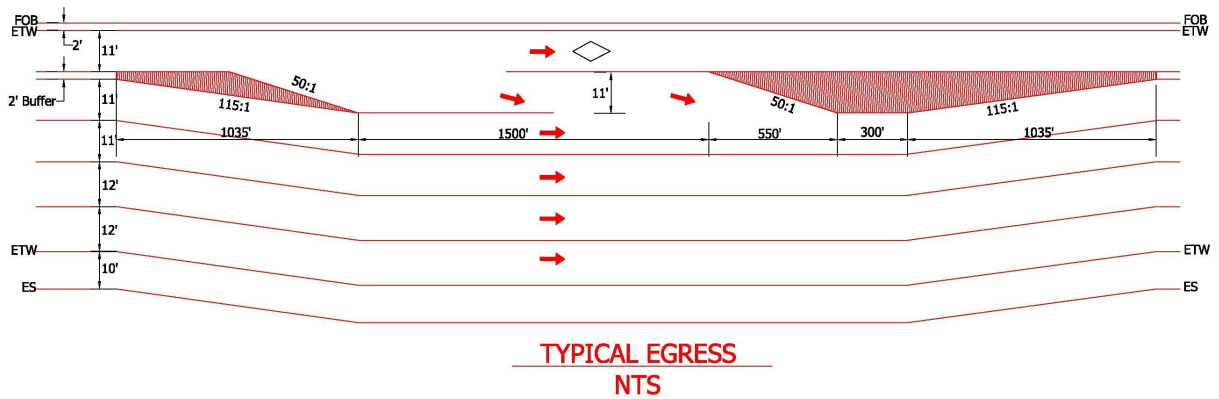


Figure 12: Typical Egress Point for HOT Lane

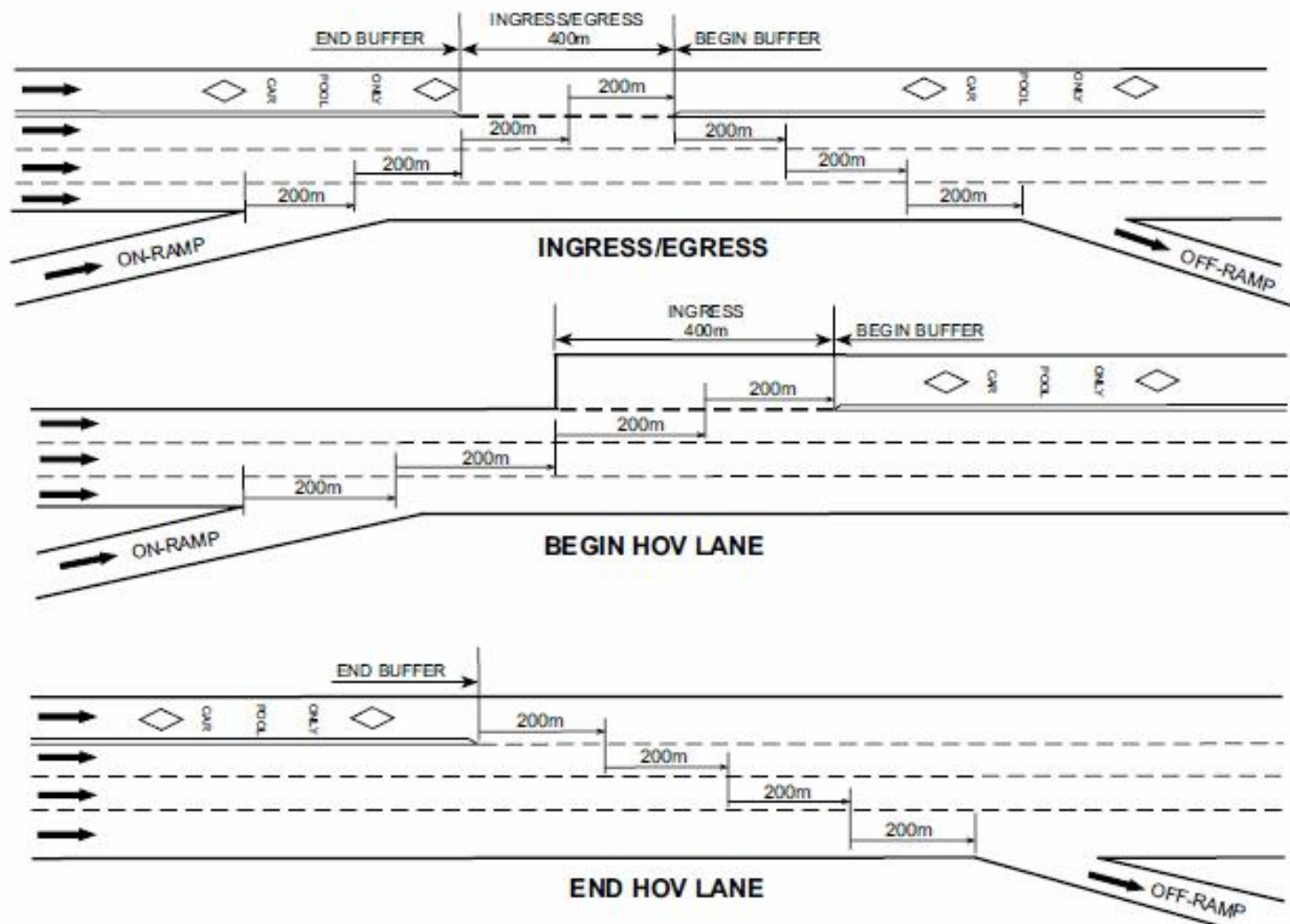


Figure 13: Caltrans Minimum Weave Distance at Buffer-Separated HOV Facilities

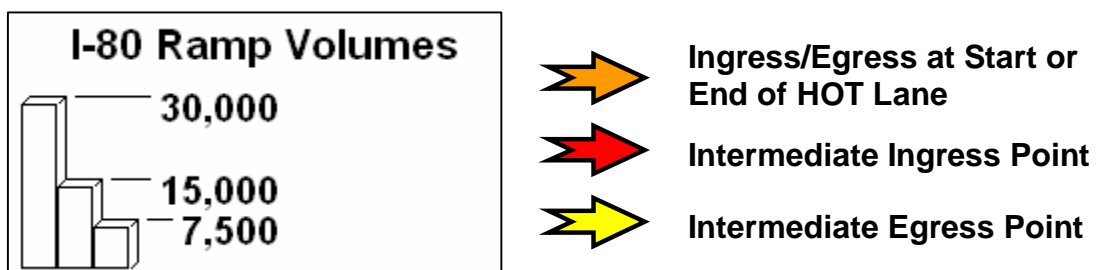
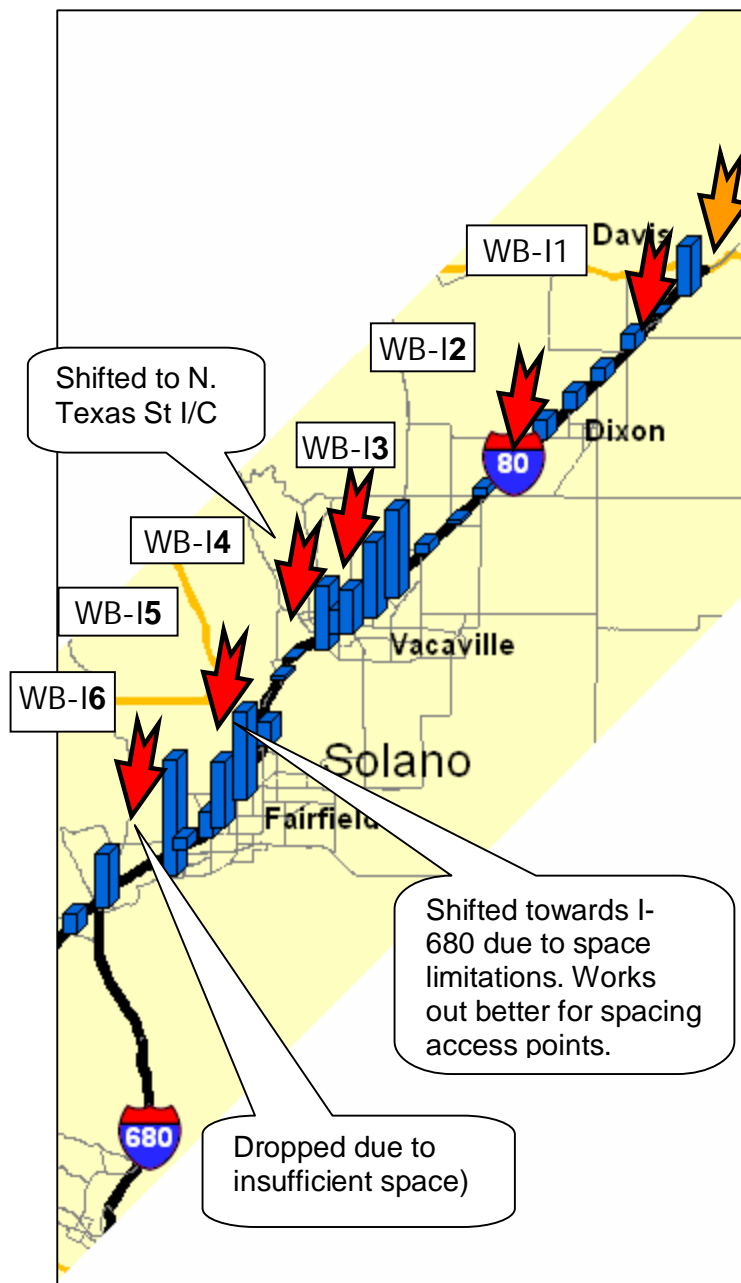


Figure 14: Potential Westbound Ingress Locations Under Study

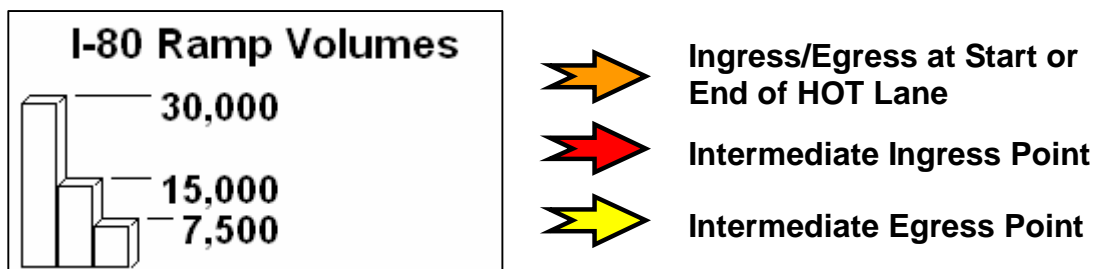
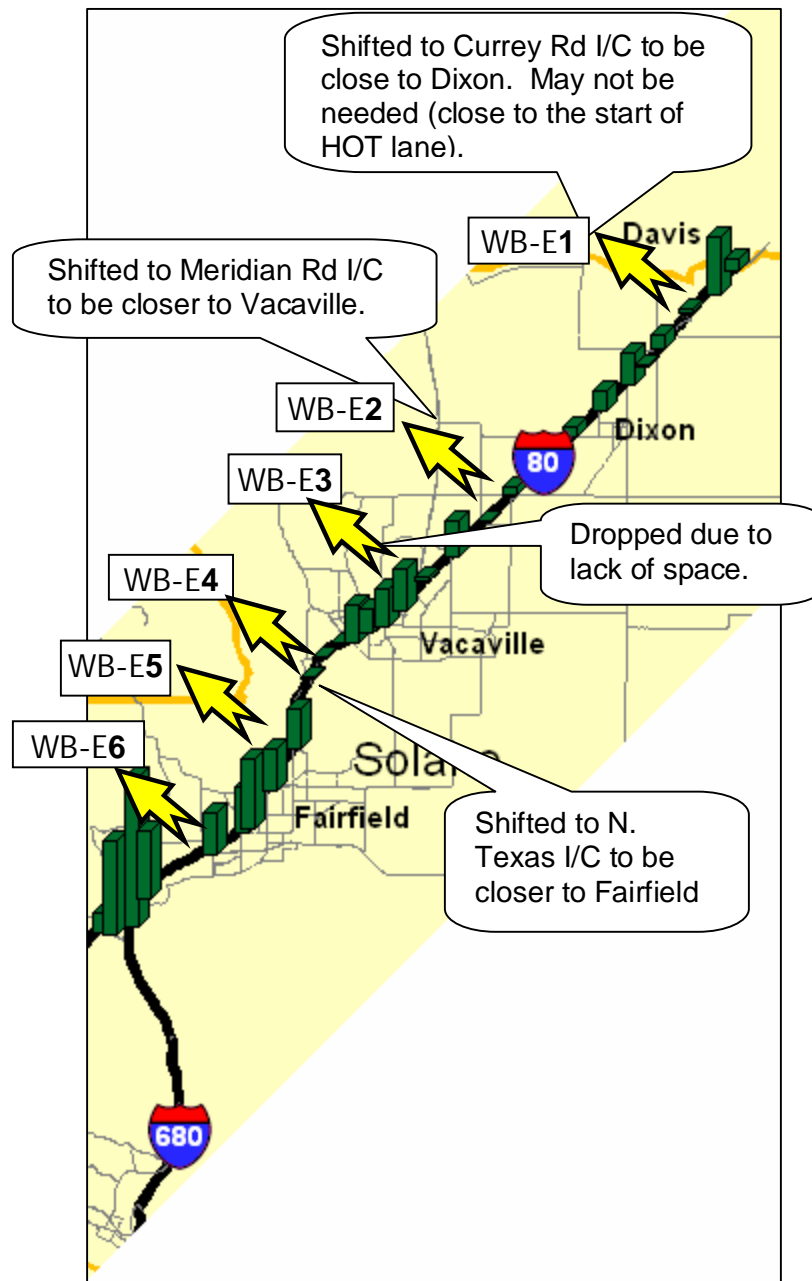


Figure 15: Potential Westbound Egress Locations Under Study

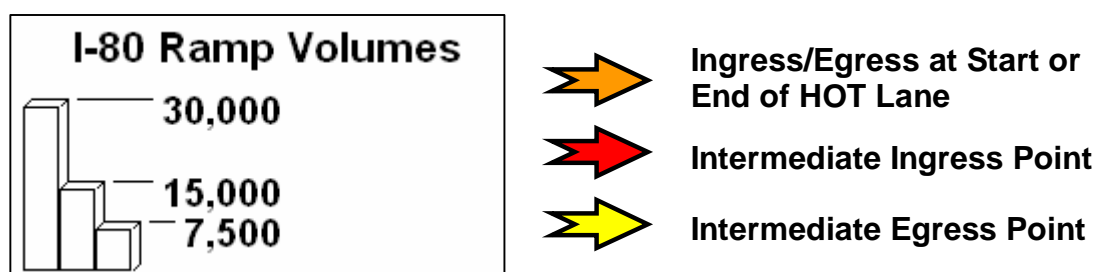
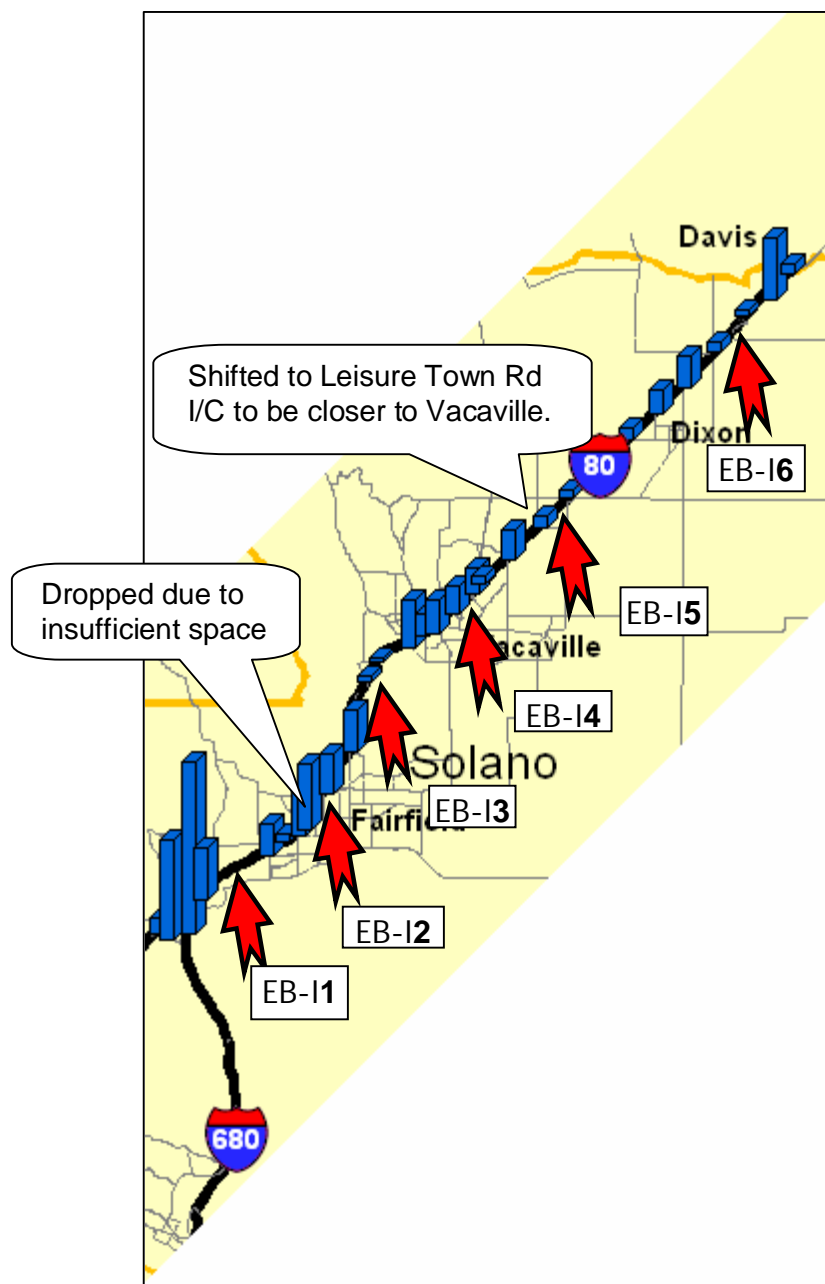


Figure 16: Potential Eastbound Ingress Locations Under Study

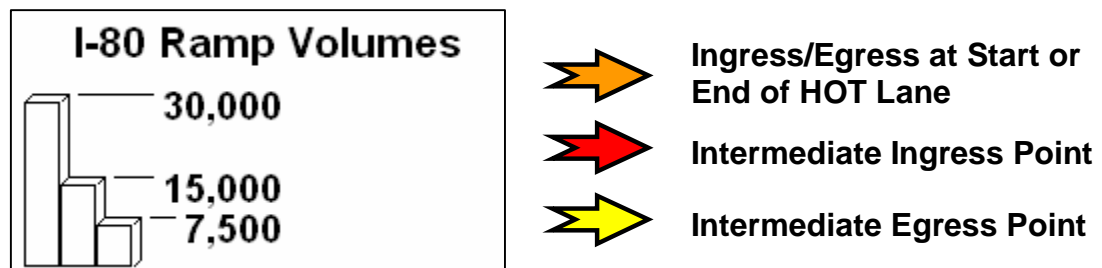
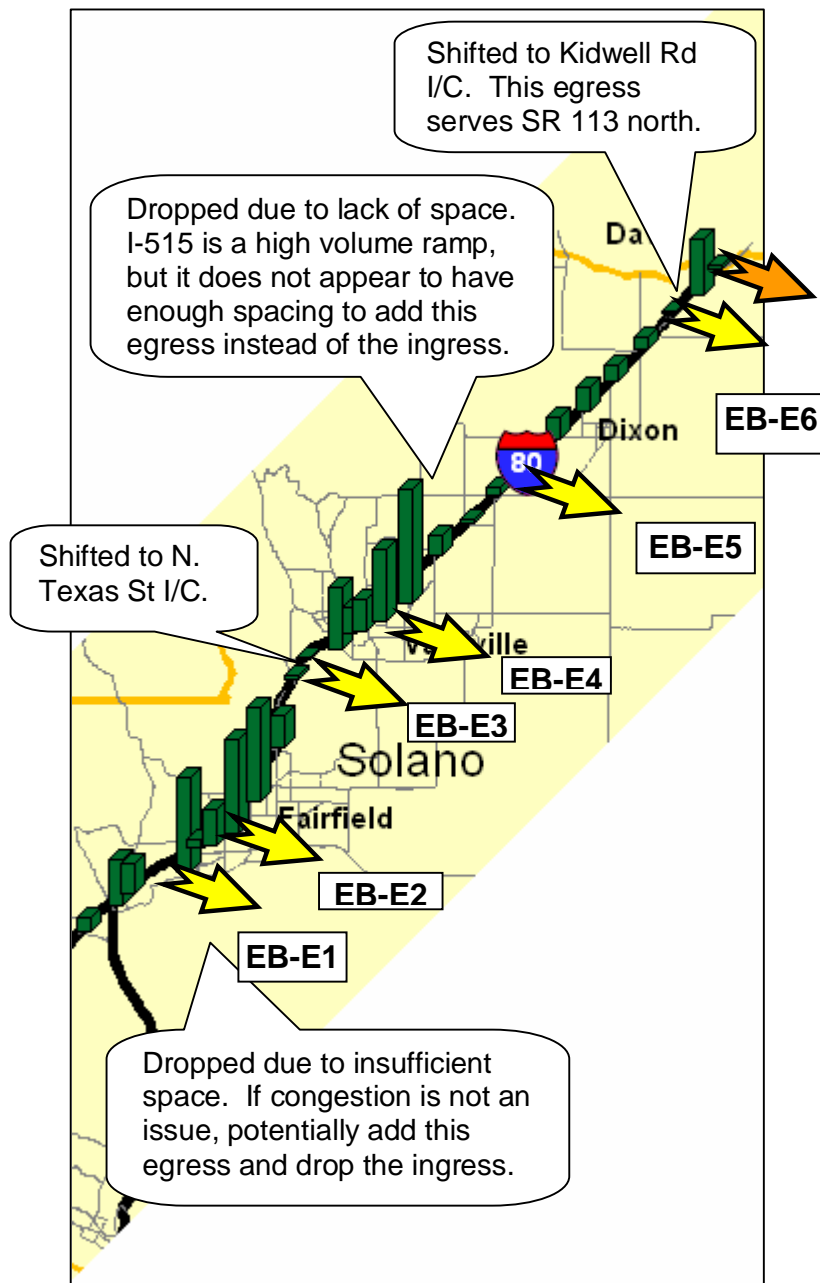


Figure 17: Potential Eastbound Egress Locations Under Study

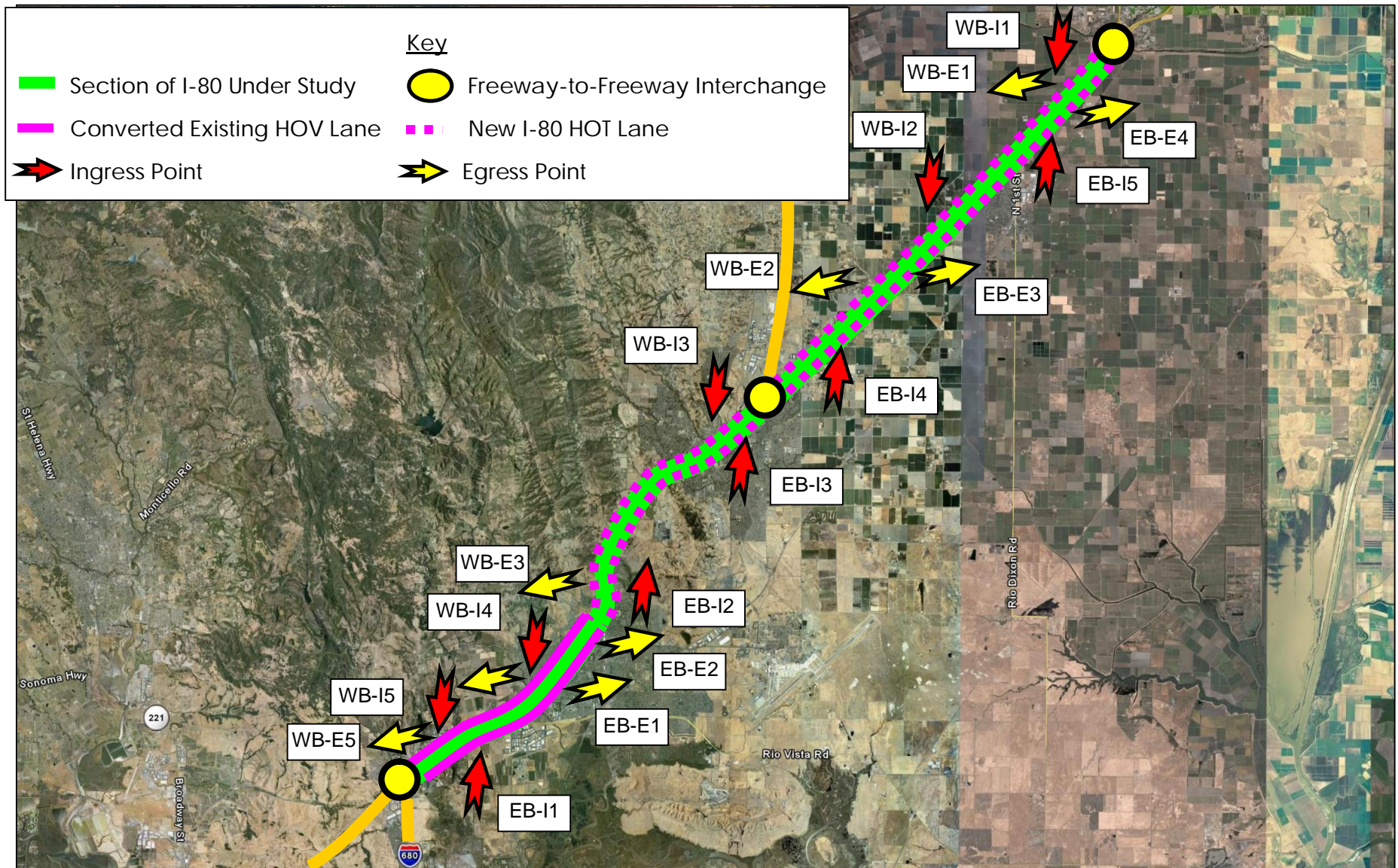


Figure 18: Potential HOT Facility for the I-80 Corridor